Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Dec 2018

Course: Performance Analysis of Electrical Equipment (EPEC 8001) **Semester: III**
Program: M. Tech. – ES
Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Briefly explain meaning of daylight linked controls.	**4**	**CO5**
Q 2	Calculate percentage THD for ac network having flow of current as: Current at fundamental frequency I_1 = 250 A Third harmonic current = 50 A Fifth harmonic current = 35 A	**4**	**CO2**
Q 3	A no load test conducted on a three phase delta connected induction motor gave the following values: No load power = 890 W Stator resistance per phase at 30°C = 0.233 Ohms No load current = 14.5 A Calculate the fixed losses for the motor.	**4**	**CO3**
Q 4	Explain steps one need to consider while selecting DG set with nonlinear loads.	**4**	**CO4**
Q 5	Briefly describe advantages of installing a 'servo stabilizer' for lighting circuits.	**4**	**CO5**

SECTION B

Q 6	Explain in detail the direct and indirect methods of estimation of technical losses in distribution system.	**10**	**CO1**
Q 7	(i) Explain the meaning of 'total harmonic distortion or THD'. (ii) Discuss any five problems that can arise due to harmonics in a system.	**10**	**CO2**
Q 8	Application= industrial lighting Room dimensions= 10x7x3 m Lighting load= 1000W Average maintained illuminance= 500 lux Target Lux/W/m^2 (from table)= 38 Calculate 1. Room index 2. Watts/m^2 3.ILER	**10**	**CO5**
Q 9	A Genset is operating at 700 kW loading with 450°C exhaust gas temperature:	**10**	**CO4**

	The DG set generates 8 kg gas/ kWh generated, and specific heat of gas at 0.25 kCal/ kg ^{O}C. A heat recovery boiler is installed after which the exhaust temperature drops by 260^{o}C. How much steam will be generated at 3 kg/ cm^{2} with enthalpy of 650.57 kCal/ kg? Assume boiler feed water temperature as 60^{o}C.		
SECTION-C			
Q 10	. An energy audit of electricity bills of a process plant was conducted. The plant has a contract demand of 3000 kVA with the power supply company. The average maximum demand of the plant is 2300 kVA/month at a power factor of 0.95. The maximum demand is billed at the rate of Rs.500/kVA/month. The minimum billable maximum demand is 75 % of the contract demand. An incentive of 0.5 % reduction in energy charges component of electricity bill are provided for every 0.01 increase in power factor over and above 0.95. The average energy charge component of the electricity bill per month for the company is Rs.11 lakhs. The plant decides to improve the power factor to unity. Determine the power factor capacitor kVAr required, annual reduction in maximum demand charges and energy charge component. What will be the simple payback period if the cost of power factor capacitors is Rs.800/kVAr.	**20**	**CO1**
Q 11	Explain the function of Soft Starters in case of Induction Motor. Also explain its starting current and stress profile during starting with the help of diagrams.	**20**	**CO3**

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Name of Examination (Please tick, symbol is given)	:	**MID**		**END**	☒	**SUPPLE**	
Name of the College (Please tick, symbol is given)	:	**COES**	☒	**CMES**		**COLS**	
Program/Course	:	**M.Tech. – ES**					
Semester	:	**III**					
Name of the Subject	:	**Performance Analysis of Electrical Equipment**					
Subject Code	:	**EPEC 8001**					
Name of Question Paper Setter	:	**Dr. Madhu Sharma**					
Employee Code	:	**40000357**					
Mobile & Extension	:	**9410133924 / 1427**					
Note: Please mention additional Stationery to be provided, during examination such as Table/Graph Sheet etc. else mention "NOT APPLICABLE":							

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Note: - Pl. start your question paper from next page

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SECTION A

S. No.		Marks	CO
Q 1	A process plant consumes of 150000 kWh per month at 0.9 Power Factor (PF). Calculate is the percentage reduction in distribution losses per month if PF is improved up to 0.96 at load end.	**4**	**CO1**
Q 2	List down common type of devices, which cause harmonics in the system.	**4**	**CO2**
Q 3	Explain the possible energy saving measures for DG sets.	**4**	**CO4**
Q 4	Explain main factors, which affect waste heat recovery from flue gasses.	**4**	**CO4**
Q 5	Highlight various ways of how the light can be controlled efficiently in a facility.	**4**	**CO5**

SECTION B

Q 6	Discuss for Demand Side Management (i) Key objectives (ii) Type of measures (iii) Customer, societal and Utility benefits	**10**	**CO1**
Q 7	A 4-pole 415 V 3-phase, 50 Hz induction motor runs at 1440 RPM at .88 pf lagging and delivers 10.817 kW. The stator loss is 1060 W, and friction & windage losses are 375 W. Calculate A. Slip B. Rotor Copper loss C. Line current D. Efficiency	**10**	**CO3**
Q 8	Compare the techno-economics of replacing 400 W HPMV lamps with 250 W HPSV, 250 W HPMV with 150 W HPSV and 125 W HPMV with 70 W HPSV lamps for same light output for 4500 hours of annual operation and consider Rs. 4.5 as per unit cost.	**10**	**CO5**
Q 9	Explain in detail - A typical modern age intelligent VFD for the 3 phase induction motor	**10**	**CO3**

SECTION-C			
Q 10	. An Engineering industry has lighting load of 40 kVA. The incoming supply voltage is 415 V during daytime and 440 V during nighttime. Lighting load during day time = 20 kVA Lighting load during night time = 40 kVA Power factor of lighting feeder = 0.7 Energy cost = Rs. 5/kWh Energy manager has installed a 50 kVA lighting transformer. The lighting voltage is set to 200 V always. i) Find out the payback period if investment for transformer is Rs. 2,50,000 and lighting load is 10 hours daily throughout the year ii) What is % Energy saving?	**20**	**CO4, CO5**
Q 11	Calculate the following from the data given below: a) kVAr required to improve PF to 0.95 lag b) reduction in kVA demand c) techno-economics of PF improvement option **Data** Rating of transformer = 1600 kVA, Average loading on the transformer = 1020 kVA Present power factor (old pf) = 0.64 (lag), Demand charges/kVA = Rs 150/kVA Unit cost of Capacitor/kVAR = Rs. 300, Transformer no-load loss/hour = 2.4 kW Transformer Full -load loss/Hour = 18.57 kW Required rating of the capacitor banks to improve the pf from the present PF of 0.64 (lag) to 0.95 (lag). Take the unit price of capacitor as Rs.300 per kVAr. **OR** With the help of diagram, explain construction, operating principle and functioning of fluid coupling.	**20**	**CO1, CO4** **CO3**